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AUG 0 1 2013

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

SUSQUEHANNA STEAM ELECTRIC STATION
LICENSEE EVENT REPORT 50-387/2013-002-00
UNIT 1 LICENSE NO. NPF-14
PLA-7060 **Docket No 50-387**

Attached is Licensee Event Report (LER) 50-387/2013-002-00. The event involved a reactor scram and associated actuations due to the Electro-Hydraulic Control (EHC) Pressure Setpoint Failing Low. This event is being reported in accordance with 10 CFR 50.73(a)(2)(iv)(A).

There were no actual consequences to the health and safety of the public as a result of this event.

No regulatory commitments are associated with this LER.

Jon A. Franke

Attachment: LER 50-387/2013-002-00

Copy: NRC Region I
Mr. J. E. Greives, NRC Sr. Resident Inspector
Mr. J. A. Whited, NRC Project Manager
Mr. L. J. Winker, PA DEP/BRP

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES:10/31/2013

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Section (T-5 F53), U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resources@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Susquehanna Steam Electric Station Unit 1	05000387	1 OF 4

4. TITLE **Unit 1 Manual Scram Due to Failure of the EHC "B" Pressure Setpoint Potentiometer**

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER 05000
06	07	2013	2013	- 002	- 00	08	01	2013	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE: 2

10. POWER LEVEL: 7%

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☒ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMER *(Include Area Code)*
C. E. Manges, Jr., Senior Engineer - Nuclear Regulatory Affairs	(570) 542-3089

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
E	TG	PCO	B135	Yes					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

At approximately 1203 hours on June 7, 2013, Susquehanna Steam Electric Station Unit 1 was manually scrammed during reactor startup. The pressure setpoint was being adjusted to the normal operating setpoint, from 750 psig to 934 psig, when all turbine bypass valves unexpectedly opened. Reactor Feed Pumps tripped and Main Turbine, High Pressure Coolant Injection (HPCI), and Reactor Core Isolation Cooling (RCIC) received trip signals on the high level setpoint Level 8 (+54 inches) due to the resultant reactor level swell. The reactor operator then inserted a manual scram. All control rods inserted. Reactor water level lowered to approximately -10 inches causing Level 3 (+13 inches) isolations. There were no automatic emergency core cooling system initiations. No steam relief valves opened during the event. All safety systems operated as expected.

This was reported as a 4-hour report in accordance with 10 CFR 50.72 (b)(2)(iv)(B) and as an 8-hour report in accordance with 10 CFR 50.72 (b)(3)(iv)(A). This event is also reportable as a Licensee Event Report (LER) in accordance with 10 CFR 50.73(a)(2)(iv)(A).

The apparent cause was failure of the Electro-Hydraulic Control (EHC) "B" pressure setpoint potentiometer due to equipment aging associated with corrosion, oxidation or dust build up on the potentiometer coil and/or wiper. Two causal factors were identified: 1) Less than adequate life cycle management based on delay in the project to replace the EHC system with a digital replacement and 2) Less than adequate periodic maintenance to prevent oxidation and corrosion buildup on the pressure set potentiometer. Key corrective actions planned include: 1) Updating the PM activity to include other motor operated potentiometers in EHC and increasing the frequency to every two years, 2) Replacing the Unit 1 and Unit 2 pressure setpoint motor operated potentiometers during next forced or refuel outage, and 3) continuing with the project to replace the EHC system.

There were no adverse consequences to the health and safety of the public as a result of this event.

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Susquehanna Steam Electric Station Unit 2	05000388	2013	- 002	- 00	2 OF 4

NARRATIVE

EVENT DESCRIPTION

Initial Plant Conditions/Status of Structures, Systems, and Components

Prior to the event, Susquehanna Unit 1 was operating in Mode 2 at approximately 7% power. Failure of the Electro-Hydraulic Control (EHC) [EIIS System Code TG] "B" pressure setpoint potentiometer was determined to be the cause of the event. No other equipment was inoperable at the start of the event that contributed to the event.

Description of the Event

At approximately 1203 hours on June 7, 2013, Susquehanna Steam Electric Station Unit 1 was manually scrammed during reactor startup. The pressure setpoint was being adjusted to the normal operating setpoint, from 750 psig to 934 psig, when all turbine bypass valves unexpectedly opened. Reactor Feed Pumps [EIIS System Code JB] tripped and Main Turbine [EIIS System Code TA], HPCI [EIIS System Code BJ], and RCIC [EIIS System Code BN] received trip signals on the high level setpoint Level 8 (+54 inches) due to the resultant reactor level swell. The reactor operator then inserted a manual scram. All control rods inserted. Reactor water level lowered to approximately -10 inches causing Level 3 (+13 inches) isolations. There were no automatic emergency core cooling system initiations. No steam relief valves opened during the event. All safety systems operated as expected.

Investigation

Review of Plant Process Computer Data identified that the 'B' Pressure Regulator setpoint dropped instantly from 776 psig to 150 psig. Based on the trend for the 'A' Pressure Regulator setpoint, the 'B' signal dropped coincident with the Operator raising the pressure setpoint. Approximately 12 seconds later, the 'B' Pressure Regulator setpoint returned to normal coincident with the Operator lowering the pressure regulator setpoint. During the 12 second period where the 'B' setpoint remained failed low, Operators did not attempt to lower or raise the pressure setpoint (shows that the 'B' setpoint changes were coincident with Operators depressing the setpoint raise and lower pushbuttons). A failure low of the 'B' Pressure Regulator setpoint under the plant conditions present, would drive the 'B' Pressure Regulator output higher than 'A' passing the 'B' signal through the pressure regulator high value gate. This would signal the bypass valves to open in an attempt to reduce pressure to match the falsely low 'B' setpoint. The reactor pressure transient was initiated by a failure low of the 'B' Pressure Regulator setpoint signal. As part of the post event investigation, a high speed data recorder was connected to the pressure setpoint circuitry and the potentiometer was driven through its full range. No significant potentiometer output anomalies were observed on the recorder data. Analysis of the circuit design determined an open at the potentiometer was the only failure mode consistent with the available data. The failure has been attributed to a high resistance spot on the potentiometer likely caused by corrosion or surface contamination. Post event exercising / wiping of the potentiometer has eliminated this high resistance spot.

History

Review of preventive maintenance (PM) activities associated with the failed component identified that a PM with a 4 year frequency was initiated in March 2000. The PM activity included: 1) wiping the potentiometers, 2) driving the pressure set potentiometer through its range while monitoring the pressure set and other signals with a recorder, and (3) removing circuit cards and cleaning edge connectors. This PM activity was performed successfully with no indication of a problem with the B pressure set equipment on April 10, 2012.

A project to replace the EHC system with a digital equivalent was previously delayed. The project is currently in the design phase with planned installation in 2016 for Unit 1 and 2017 for Unit 2.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
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Susquehanna Steam Electric Station Unit 2	05000388	2013	- 002	- 00	3 OF 4

NARRATIVE

System Background

The Susquehanna EHC system is a General Electric Mark I EHC system. The EHC system is designed to prevent over-pressurization of the reactor vessel in case of equipment failure. There are two pressure channels (A/B) with separate pressure transmitters, pressure setpoint potentiometers and circuitry that are calibrated to be offset by a nominal 3 psi bias to maintain the "A" in control. The channel with an output that is calling for the most open valves is used for control of the control and bypass valves. For this failure, the open "B" pressure setpoint potentiometer condition resulted in the "B" pressure regulator having a pressure input much larger than the setpoint resulting in a large output demanding that the bypass valves be fast opened.

Reporting Criteria

This was reported as a 4-hour report in accordance with 10 CFR 50.72 (b)(2)(iv)(B) and as an 8-hour report in accordance with 10 CFR 50.72 (b)(3)(iv)(A). This event is also reportable as a Licensee Event Report (LER) in accordance with 10 CFR 50.73(a)(2)(iv)(A).

CAUSE OF THE EVENT

The apparent cause of the EHC "B" pressure setpoint potentiometer failure is identified as equipment aging associated with corrosion, oxidation or dust build up on the potentiometer coil and/or wiper. Two causal factors were identified:

Causal Factor 1: Less than adequate life cycle management based on delay in the project to replace the EHC system with a digital replacement.

Causal Factor 2: Less than adequate periodic maintenance to prevent oxidation and corrosion buildup on the pressure set potentiometer. It is likely that performing no PM on this component for the first ~18 years of plant operation allowed corrosion/oxidation to build up which was insufficiently addressed by subsequently performing a PM to wipe the potentiometer on a 4 year frequency.

ANALYSIS/SAFETY SIGNIFICANCE

Actual Consequences:

When all bypass valves opened, Reactor Feed Pumps tripped and Main Turbine, High Pressure Coolant Injection (HPCI), and Reactor Core Isolation Cooling (RCIC) received trip signals on the high level setpoint Level 8 (+54 inches) due to the resultant reactor level swell. The reactor operator then inserted a manual scram. All control rods inserted. Reactor water level lowered to approximately -10 inches causing Level 3 (+13 inches) isolations. There were no automatic emergency core cooling system initiations. No steam relief valves opened during the event. All safety systems operated as expected.

Potential Consequences

The main turbine bypass valve fast open capability is required to function during the turbine generator load rejection and feedwater controller failure transients. Opening the bypass valves during the pressurization event mitigates the increase in reactor vessel pressure, which affects the Minimum Critical Power Ratio (MCPR) during the event. An inoperable Main Turbine Bypass System may result in a MCPR penalty.

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Susquehanna Steam Electric Station Unit 2	05000388	2013	- 002	- 00	4 OF 4

NARRATIVE

CORRECTIVE ACTIONS

Key corrective actions include:

1. The PM activity will be updated to include other motor operated potentiometers in the main turbine EHC system and the frequency will be increased from every four years to every two years.
2. The Unit 1 and Unit 2 pressure setpoint motor operated potentiometers will be replaced during next forced or refuel outage.
3. The project to replace the EHC system is currently in the design phase with planned installation in 2016 for Unit 1 and 2017 for Unit 2.

PREVIOUS SIMILAR EVENTS

Susquehanna Unit 2 had a recent scram during main turbine control valve testing due to a faulty subcomponent of #1 Turbine Control Valve. This event was as follows:

LER 388/2012-003-00, "Unit 2 Automatic Reactor Scram While Performing Turbine Control Valve Surveillance Testing"